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WOLF MANAGEMENT IN BRITISH COLUMBIA:

THE PUBLIC CONTROVERSY

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ABSTRACT

Results from a mail-out survey of three major interest groups - the British Columbia Cattlemen's Association, the Federation of British Columbia Naturalists, and the British Columbia Wildlife Federation - showed there was agreement among the groups on several basic aspects of wolf management. Most respondents supported wolf control for the protection of livestock in established agricultural areas and preferred the current government-administered program to wolf control by private citizens. Unless cost-effective, compensation to ranchers for livestock losses was an unacceptable alternative to lethal wolf control. There was consensus that wolf predation was not the primary cause of major and extensive ungulate declines in British Columbia and quick-killing methods were regarded as the most humane means of control. There were significant differences among interest groups on specific issues of wolf management. Non-ranchers felt predator-related livestock losses were not significant to the continued viability of the beef industry in British Columbia and mismanagement of livestock was an important factor affecting losses. Environmentalists opposed wolf control for the benefit of prey populations unless hunting of those populations was first eliminated and many expressed negative views of the wolf control program and its impacts on wildlife although awareness of program specifics was poor among all three interest groups. Several non-lethal alternatives to wolf control were suggested but all had serious drawbacks. Some respondents also thought agriculture should not be expanded in northern British Columbia because of conflicts with wildlife. Recommendations are given to improve public relations and communications among all parties.

There is a tendency to think of ecological problems as scientific and technological when they are actually social and cultural.

George Schaller

PREFACE

This study was started in 1981 before names were changed in various government agencies. The Ministry of Environment is now the Ministry of Environment and Parks, the Ministry of Forests became the Ministry of Forests and Lands, the Fish and Wildlife Branch is now called the Wildlife Branch.

The opinion, conclusions and recommendations expressed in this Bulletin are those of the author and not necessarily those of the Wildlife Branch.

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INTRODUCTION

Wolf management is a topic of considerable public controversy in British Columbia. The controversy is typified by polarized and emotional viewpoints and encompasses a diverse array of issues and participants.

The chief active participants are the special interest groups. There is cross-membership between groups - environmental and conservation concerns are not unique to any one organization. Based on their major concerns, however, these groups can be divided into three basic camps. First there are the livestock owners, most of whom are cattlemen. Their prime concern is the protection of their livestock. Second are the hunters whose major concern is the maintenance of abundant ungulate populations for harvesting, wildlife conservation for non-consumptive purposes only, and environmental protection. The third group shall be referred to here as environmentalists and includes organizations such as Greenpeace, the Sierra Club, the Federation of B.C. Naturalists, the Association for the Protection of Fur-bearing Animals, the Scientific Pollution and Environmental Control Society, and others.

Environmental and conservation concerns are not the exclusive properties of environmentalist organizations such as Greenpeace. Hunter groups originally started the conservation and environmental protection movements. They still fight for those issues although they also ask for harvestable prey populations. Therefore hunters fight for the same goals as environmental organizations but these organizations are concerned with only selected issues and do not consider the interests of other groups.

In the midst of the controversy is the British Columbia Fish and Wildlife Branch. This Branch of the Ministry of Environment is responsible for wildlife management in British Columbia. The staff develop management policies and programs, conduct research, and offer technical advice. The Branch was formerly responsible for the implementation of problem animal control, but during 1980, some of that function was transferred to the newly created Conservation Officer Services Division.

In addition to the many issues and participants, the controversy is complicated by other factors. The wolf (Canis lupus) continues to be the subject of myth and misinformation. There is suspicion of the Fish and Wildlife Branch, based on past management actions and sensationalization of the issues by the news media. The result is a confusing debate that serves only to increase the animosity and distrust among all parties.

This study was initiated to examine the social aspects of wolf management and to identify factors contributing to the current public controversy. Based on study results, recommendations are provided regarding potential mechanisms for improving public relations and communications among all parties so that the current acrimony and debate might be reduced and available resources put to maximum benefit for wildlife.

HISTORY OF WOLF MANAGEMENT IN BRITISH COLUMBIA

Wolf control in British Columbia began with the European settlement of the province. At that time, British Columbia was largely undeveloped wilderness and wolves were regarded by most white people as vermin. Wolf control was based upon self initiative, and individuals dealt with wolf problems as they saw fit.

Bounties

During the early 1900's, a more concerted effort was made to control wolves through a bounty system. Between 1922 and 1956, the British Columbia government paid out approximately one million dollars for bountied animals (Pimlott 1961). Most of the wolves taken during this time were either trapped or shot (Hatler 1981).

The bounty system was terminated in 1956 for several reasons including high cost, inefficiency, and widespread abuse (F. Tompa 1983a). As Young and Goldman (1944) pointed out, bounties encourage indiscriminate killing of wolves rather than destruction of damage-causing individuals. Some of the abuses of the bounty system in North America included substitution of scalps from domestic animals or coyotes, release of trapped female wolves, transport of skins or scalps to areas where bounties were highest, and collection of more than one bounty for a single wolf (Young and Goldman 1944).

Government-Operated Wolf Control

In 1947, the government established its own wolf control program. The Predator Control Branch was created and five predatory animal hunters were hired. Their duty was to reduce the populations of large predatory animals in British Columbia as effectively as possible. The implicit justification for this program was to reduce the numbers of predators that were damaging domestic livestock and competing with man for ungulates (M. Warren, pers. comm.).

By 1949, poisons were being used to kill wolves, and soon they became the major tool of the government program (Hatler 1981). The poisons included strychnine, cyanide, and, later in 1950, sodium monofluoroacetate (compound 1080). Usually the poisons were administered by concealing them in baits, but cyanide was also used in mechanical devices known as cyanide guns or M44's that propelled the cyanide pellet into the mouth of any animal tugging upon the baited trigger. Some cyanide and strychnine were made available to ranchers during the late 1940's but they apparently did not make efficient use of these poisons (Hatler 1981).

The attitude of the general public towards the wolf at this time was still negative, so there was virtually no public opposition to the control program (M. Warren, pers. comm.). Much public support for wolf control was stimulated in 1953 when rabies erupted near Fort Vermilion in northeastern Alberta. The government had already geared up for an extensive predator poisoning program in northern British Columbia, and this rabies scare provided added public support for the program (M. Warren, pers. comm.).

Only one wolf was diagnosed as rabid in Alberta during this rabies outbreak (Theberge 1973) but nevertheless, it was feared that wolves might transmit the disease west across the Rockies (M. Warren, pers. comm.). The extensive poisoning program went ahead and continued even after the rabies scare had subsided.

Throughout the 1950's and 1960's, baits laced with poison were distributed over much of central and northern British Columbia. During winter, carcasses impregnated with compound 1080 were often dropped on ice-covered lakes and rivers. Meat not consumed by predators or scavengers fell into the water during the spring thaw and the 1080 was diluted. Most of these baits were not checked after they had been dropped because of the high cost of flying into the remote drop sites (M. Warren, pers. comm.).

Although public concern over this program was minimal, some natives perceived danger. Indians in the Coldfish Lake region were reportedly afraid to drink from the lake or consume berries growing nearby when they discovered that a poisoned carcass had been located on the lake the previous winter (M. Warren, pers. comm.).

During the latter part of the 1950's, the massive control program was still in force despite observations in the Department of Recreation and Conservation annual report that numbers of moose in the Prince George district were so dense the animals were overbrowsing their range (Theberge 1973).

The 1960's brought significant changes. The indiscriminate predator control program had become more costly than the previous bounty system (Pimlott 1961). Attitudes of biologists in the Fish and Game Branch were also changing and the general public was becoming more environmentally conscious (M. Warren, pers. comm.). As a result, in 1961, poisoning programs ceased in wilderness areas.

In 1963, the Predator Control Division was disbanded and administration of control was transferred to the Regional offices in the following year. Wolf control activities by the Fish and Wildlife Branch were minimal until 1974 when animal control officers were established in each of the regions.

Other notable changes during this time were the formation of a committee on predator control policy in 1968; and later in 1974, one provincial and nine regional predator management advisory committees. The committees were set up to provide advice on policy matters and to contribute to program planning and implementation. In 1966, the wolf was designated a big game animal, which meant that bag limits, seasons, and restrictions on hunting methods could be implemented. Trapping was disallowed that year but later permitted when, in 1976, the wolf was legally identified as a fur-bearing animal (Tompa 1983a).

In 1975, the use of poisons was placed under stricter control and the removal of wolves was limited to specific problem animals responsible for killing, mauling, or harassing domestic animals or posing a significant threat to human safety. Control was reactive and site-specific and the stated goal of the Fish and Wildlife Branch had become predator management rather than simple predator control (Tompa 1983a).

In 1978, a study completed by A.T. Bergerud (1978) indicated that overhunting and predation were causing declines in some caribou herds in northern British Columbia. On the basis of this study, the Fish and Wildlife Branch initiated a closure on the hunting of caribou cows, a restricted season for bulls, and compulsory inspection of all hunter-killed caribou. They also announced their intent to conduct a project to investigate the effects of wolf control upon caribou. Some people regarded such a project as too little, too late. Conversely, many environmental groups were bitterly opposed to such action and a public meeting was organized by the Sierra Club for 1978 November 30 in Vancouver to discuss the matter. Several members of the Fish and Wildlife Branch were present, as well as a number of prominent wildlife biologists from outside government. The discussion during this public meeting was heated. Following this meeting, on 1978 December 01, a symposium on wolf predation was held at Simon Fraser University to discuss the issues in a controlled forum (Ramsey and Seip 1979). Participants included wildlife biologists and representatives from environmental organizations.

The following month, Rafe Mair, the then Minister of Environment for British Columbia, announced a temporary moratorium on the use of poisons in predator control. In the Minister's own words (Ministry of Environment news release, 1978, "The Moratorium" 1978):

> "The moratorium period will give me the opportunity to assess the complexity of the poison program and time to develop a course of action that will be in the best interest of ranching and wildlife interests."

The effect of this moratorium on the use of poisons and the public controversy in British Columbia was significant. Some disgruntled guide-outfitters, hunters, and ranchers reportedly began or intensified their own private poisoning programs, using a variety of killing agents such as strychnine (purchased in Alberta), anti-freeze, poison hemlock, and broken glass (W. Otway, D. Lay, pers. comm.).

In addition, the Fish and Wildlife Branch was left with hunting and trapping as their only alternatives for controlling problem wolves. As wolves are extremely difficult to hunt from the ground, particularly in the rough terrain of northern British Columbia, aircraft were used when possible. However, the use of aircraft for this purpose was a controversial practice and the economic efficacy of chasing wolves with helicopters was questioned by many. As well, Branch personnel were concerned about using up a large part of their limited aircraft budget for the pursuit of problem wolves.

In 1979, the Fish and Wildlife Branch applied to the Pesticide Control Branch for a new pesticide permit. The application was vigorously opposed by many individuals and groups, and twice the permit was withdrawn on the basis of technical errors. On 1980 January 31, it was finally granted. The permit, valid for 3 years, became effective 1980 February 06.

Under the conditions of this permit, the Fish and Wildlife Branch was allowed to use a maximum of 5 g of 1080 per year for wolves and coyotes. Not more than 250 small wolf baits were permitted per year; a small bait consists of a piece of meat containing enough 1080 to kill an adult wolf. In 1983, the permit was renewed and the maximum number of wolf baits increased to 400.

Following issuance of the original pesticide permit, the province-wide debate subsided temporarily. However, with increasing concern over the impact of wolf predation on declining populations of black-tailed deer on northern Vancouver Island and on several ungulate species in northeastern British Columbia, the heated public controversy regarding wolf control resumed.

DEVELOPMENT OF THE WOLF MANAGEMENT CONTROVERSY

The public controversy over wolf control is a comparatively recent development in the history of predator control in North America. Until the late 1960's, the general public was either supportive or indifferent to wolf control. However, during the sixties, a major change in public attitudes occurred. This change led to the development of a strong conservation movement and the first significant public opposition to wolf control.

Rise in Environmental Concern

Environmental consciousness developed during the sixties and was the spark that ignited public controversy over wolf control. A most important factor contributing to this change in social attitude was the emergence of disturbing ecological evidence regarding earth's environment and man's impact upon it. Supplementing this was the advancement in communications technology and thus public awareness. By the 1960's, radio and television had become commonplace and information and current events were reaching the public more quickly and vividly than ever before.

As a result, more people were aware of what was happening to the earth's environment, and this stimulated public concern. In discussing the importance of television in the development of the conservation movement, Lyn Hancock (1980) wrote, "That the mass medium of television during the 1960's and 1970's had a tremendous influence in making the general public more conservation conscious is almost axiomatic."

The warnings of ecologists were upsetting. The public was informed that the world was fast becoming overpopulated and polluted, and that non-renewable resources were running out. Evidence had confirmed that DDT, a pesticide which has been used for years, was building up in the ecosystem causing serious harm to some organisms. The environmental dangers associated with pesticides were conveyed with great impact in the popular book Silent Spring by Rachel Carson. This book, which was published in 1962, had a profound influence upon many people.

Emergence of Non-Consumptive Users

The environmental consciousness of the 1960's marked the emergence of a group of wildlife enthusiasts often referred to as 'non-consumptive'[1] users. This group differed from other traditional wildlife groups in that non-consumptive users had no interest in harvesting wild animals. During the 1960's, these individuals organized themselves into groups or joined existing groups such as the Sierra Club and began to voice their concerns (Hancock 1980).

A basic premise of the non-consumptive wildlife enthusiasts was that all species had value, at least existence or aesthetic value, and destruction without cause was therefore unwarranted. In his book, The Wolf: The Ecology and Behavior of an Endangered Species, Mech (1970) writes of the naturalist:

> "To these people the wolf is of considerable aesthetic value, and if it had no other worth at all, they would fight to preserve it on these grounds alone. They feel that their right to enjoy the wolf should deserve as much consideration as the big game hunter's right to enjoy his sport."

Hunters, who comprise the majority of consumptive users, favoured wolf control, although few wanted their total elimination in British Columbia (M. Warren, pers. comm.). The wolf was a competitor for the highly sought after prey species. As a result, hunters had an interest in the situation not shared by non-consumptive users and this difference contributed to a deepening rift between these two user groups.

Changing Attitudes Towards the Wolf

Along with increased environmental concern during the 1960's, public attitudes towards the wolf were changing. Growing numbers of people rejected Theodore Roosevelt's portrayal of the wolf as "the beast of waste and desolation" (Rutter and Pimlott 1968), and were appalled by the historical treatment of the wolf.

With the exception of native groups, wolves had traditionally been regarded by most people as vermin: blood-thirsty beasts that serve no useful purpose and should be eradicated. Almost every negative characteristic imaginable has been attributed to the wolf. In the words of B. Lopez (1978):

> "There was a great mystery about the wolf and a fabulous theater of images developed around him. He was the Devil, red tongued sulfer breathed, and yellow eyed; he was the werewolf, human cannibal; he was lust, greed, and violence that men saw in themselves."

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[1]Non-consumptive is a controversial term because even persons seeking only to view or photograph wildlife may cause harm by alarming or disturbing the animal. The term is used here to differentiate those people who pursue non-extractive recreational use from those who harvest.

A major feature of man's negative attitude towards the wolf was a deep fear. Rutter and Pimlott (1968) wrote:

> "The belief that wolves are dangerous to man is deeply ingrained in our consciousness. In spite of the technological advancement of the age it seems that the fear and folklore of centuries still dominates our thinking when questions of men and wolves are concerned."

Clearly the protection of domestic livestock was a causal factor in man's war on wolves but there were other less apparent factors that were also important. Lopez (1978) summarizes these in his description of the attitudes of American settlers:

> "It was against a backdrop of these broad strokes - taming wilderness, the law of vengeance, protection of property, and inalienable right to decide the fate of all animals without incurring moral responsibility, and the strongly American conception of man as the protector of defenceless creatures - that the wolf became the enemy."

The intense desire to rid the land of wolves was carried to extreme lengths. In Europe, forests were burned to destroy the breeding places for wolves (Rutter and Pimlott 1968), and, quoting Lopez (1978):

> "A generally accepted practice in Europe was an almost ritualized purging of wolves from the countryside after wars. Preying on thousands of dead bodies on the battlefields and left unmolested by a population at war, the wolf population increased and took advantage of untended flocks. Members of a victorious army, returning home elated, immediately set about killing the wolves and regarded the activity simply as a continuation of the war."

The decimation of the wolf continued in North America following colonization by immigrants from other parts of the world. Methods were crude and rather inefficient at first but they gradually improved and by the twentieth century massive wolf control campaigns were launched. The governments of the day fully supported such programs. At first, the support was in the form of bounty payments, but eventually government hunters were hired for the explicit purpose of exterminating wolves. In the United States, Congress approved the funds necessary for such programs in 1916 (Rutter and Pimlott 1968), whereas in Canada, similar actions were not taken until after World War II.

Up to and during this period of government control, wolves were destroyed in every conceivable manner, with little consideration for humaneness or damage to non-target species. Young and Goldman (1944) list the

wolf control techniques used in North America:

> "... traps, pits, corrals, deadfalls, the icebox trap, the edge trap, piercers, fishhooks, snares, set guns, steel traps, ring hunts, drives, hamstringing and lassooing, the use of dogs, stalking, den hunting, professional hunting, bountying, and poisoning."

Aerial hunting may also be added to Young and Goldman's exhaustive list.

Poisons eventually became the major tool in the war against wolves. The extent to which some livestock owners were willing to go to kill wolves is illustrated by an example from Young and Goldman (1944):

> "There was a sort of unwritten law of the range that no cowman would knowingly pass by a carcass of any kind without inserting in it a goodly dose of strychnine sulphate, in the hope of eventually killing one more wolf."

This kind of widespread and indiscriminate poisoning caused much destruction of wolves and other species, and later became the focal point of the anti-wolf control lobby.

Public rejection of the traditional wolf image was late in coming. Even early twentieth century conservation writers like Dr. William Hornaday and Theodore Roosevelt referred to wolves in a negative context (Rutter and Pimlott 1968). Their attitudes were not surprising considering that an objective study of the wolf had yet to be conducted.

Among the scientific community, attitudes towards large predators began to change following the publication of Aldo Leopold's book, Game Management in 1916, and Paul Errington's subsequent discussions on predation (Rutter and Pimlott 1968). Stanley Young and Edward Goldman's taxonomic and historic discussion about wolves, The Wolves of North America was published in 1944. Also in 1944, the first objective and comprehensive treatment of wolf ecology was published: Adolf Murie's work, The Wolves of Mount McKinley. According to Klinghammer (1975) this book "broke the spell of Little Red Riding Hood."

Many individuals have conducted wolf research since that time. One of the most thorough and accurate discussions of wolf ecology is Mech's book, The Wolf: The Ecology and Behavior of an Endangered Species (1970). This is a very important work on the wolf and contributed to the education of many modern biologists.

The results of these scientific studies revealed the wolf as a very different creature from that portrayed in most historical literature. It became apparent from these studies that man and wolf had similarities that resulted in competition and that possibly affected the extreme attitudes men had towards wolves. As described by Hall and Sharp (1980):

> "The similarities between the wolf and the hunting gathering human are impressive. Both are intelligent, clearly more intelligent than the prey upon which they subsist. Both are capable of extreme physical exertion and more important, of sustained physical exertion at a relatively high level. Both exploit open ground and broken forest areas. Neither species has any single physical attribute that allows it either to over power or to outrun large prey at will. The two species are about the same body weight and, though not among the largest animals in the world, are virtually immune from predation."

One of the most significant facts to emerge from scientific studies is that wolves are not by nature mankillers. Evidence from many studies showed that healthy wolves avoid man, even when approached while on a kill or with pups. Some researchers have even taken pups from wolf dens while the parents stood by (Mech 1970).

Attempts to verify attacks upon humans by healthy wolves have mostly failed. Attacks upon humans have occurred, particularly in Europe, but the behaviour of the attacking wolves suggests that most were probably rabid. One exception is the so-called "Beast of Gevaudan" that terrorized the Gevaudan region of France. Two animals were involved and between the years of 1764 and 1767 they reportedly attacked over 100 people, killing 64. The pair were eventually destroyed and the morphology of the beasts indicated that they were probably wolf-dog hybrids (Rutter and Pimlott 1968).

In North America, authentic wolf attacks upon people are rare. Rutter and Pimlott (1968) describe a case in Ontario in 1942 as, "the one record of a wolf attack on a human that seems to bear consideration." Apparently, a man moving along railway tracks on a speeder one night was knocked off the tracks, together with his vehicle, by a wolf. The man defended himself against the wolf with two axes for about 25 minutes until help arrived and the wolf was finally killed. Again, the behaviour of the wolf indicated that it was probably rabid.

One other case of an apparent attack in North America occurred in 1980 on Hernando Island near Campbell River in British Columbia. A woman was followed down the beach by a lone wolf. She retreated into the water and defended herself against the animal with a rock. The animal snapped at her hand but no further attack ensued. By the time the Fish and Wildlife Branch could investigate, the tracks left by the animal had washed away. As a result, it is unclear whether in fact the attacking animal was a wolf (F. Tompa, pers. comm.).

By the 1960's, some authors began to convey the new image of the wolf to the general public, an image unlike that of the bloodthirsty beast that was still common on the articles about wolves in some hunting magazines. Mech (1970) summarizes some of the more influential works:

> "Lois Crisler's excellent book, Arctic Wild, describing her adventures in raising a couple of litters of free-ranging wolves on the tundra, was published in 1958. Adolph Murie's, A Naturalist in Alaska, recounted in detail his experiences with wild wolves, appeared in 1963. That same year an article in National Geographic (Allen and Mech 1963) which featured the Isle Royale wolf studies also reached numbers of people. Jerome Hellmuth's, A Wolf in the Family, was published in 1964, and it related the true story of a tame wolf raised by a family in Seattle. The World of the Wolf, by R.J. Rutter and D.H. Pimlott, released in 1968, provided a factual popular account of the wolf's life history and included beautiful photos of the animal."

Mech (1970) goes on to discuss Farley Mowat's book, Never Cry Wolf, published in 1963 as somewhat lacking in scientific rigour but important because it caught the attention of the public and helped to dispel the traditional myths about the wolf.

One indication of the changing public image of the wolf during the early sixties was the response to wolf howling nights at Algonquin Provincial Park in Ontario. Douglas Pimlott was instrumental in promoting these events and the public response was overwhelming. In Pimlott's (1968) own words:

> "In 1963 the first official wolf howl was held as a part of the interpretive program of the Algonquin Park Museum. We were uncertain about the number that might attend but we thought that there might be about 25 cars in the cavalcades as we searched for wolves. Instead, every campground emptied; 168 cars - an estimated 800 people created the biggest traffic jam that had ever been witnessed in the park. It was however, a howling success in other ways, for the attitudes of those who attended told us better than words that people were thinking positively, not negatively, about wolves."

Since the early sixties, wolves have remained a popular topic for writers. One book that has reached a large audience is the 1978 publication, Of Wolves and Men, by Barry Holsten Lopez. The book is a popular account of man's perceptions and treatment of the wolf throughout history.

The image of the wolf has been influenced through the medium of film as well as print. The benign, anthropomorphic image of the predator is common in "The Wonderful World of Disney" and has been further emphasized in other television series such as "Grizzly Adams" (Hancock 1980). Although the images of animals presented in these films are often as inaccurate as the traditional myths about the species, they appealed to a wide audience and influenced peoples' perceptions and attitudes towards predatory animals. As described by McCullough (1981) in a paper on human/bear conflicts:

> "It seems that earlier grotesque beliefs that predators were evil and had to be eradicated to make the world safe for lambs were overthrown at the cost of creating a new and beguiling myth of the benevolence of nature."

As well as these television series, there have been important documentary films produced in North America that stimulated positive reactions towards the wolf. Three of the more influential films were Death of a Legend and Tundra Wolves produced by the National Film Board of Canada and The Wolf Man, a documentary produced by NBC and shown in the early 1970's. This latter film, which showed the aerial gunning of wolves, stimulated increased opposition to many wolf control programs in the United States (Hornocker 1974). The kind of attitudinal change that resulted from the favourable media presentation of the wolf during the sixties and seventies is described by Mech (1970):

> "The net result of all the sympathetic publicity is that an increasing number of people have come to appreciate the wolf as a symbol of wilderness; an unwitting agent of nature's complex pressures; a beautiful beast, shy, strong, wild, and free."

The increased scarcity of the wolf in North America south of the 49th parallel also affected this attitude shift. By the 1970's, the grey wolf had been eradicated from almost all the United States (excluding Alaska) and parts of southern Canada. The remaining wolves and the wilderness they represented were therefore held in even greater esteem by those concerned.

In addition, people were becoming aware that the wolf had positive ecological significance. Although the full impact of predation on ungulates is still not fully understood, there was evidence that population fluctuations of ungulates were more extreme in the absence of predators. The irruption of mule deer in the Kaibab Plateau was frequently cited as evidence for this although the actual population fluctuations and the significance of predators in this example may have been overstated (Caughley 1970). Mech (1970) describes other examples such as the Isle Royale study, where moose were prone to periodic population crashes prior to colonization of the island by wolves. He cites another example from Yellowstone Park where wolves had been eliminated and large herds of elk were periodically subject to starvation because the vegetation was being overbrowsed.

Subsequent studies have shown that wolf/prey interactions are much more complex than some of the early research had indicated. Recent findings from Isle Royale showed that predation rates can change dramatically with snow depth, which can influence the relative densities of predator and prey (Allen 1979). Similarly, studies of wolves and deer on Vancouver Island during the 1970's showed that many of the generalizations about wolves and their prey based on earlier studies in the central parts of North America were inapplicable in a coastal forest ecosystem (D. Hebert, pers. comm.).

Nevertheless, these early population studies helped change many peoples' attitudes towards the wolf, particularly those of biologists (D. Hatler, pers. comm.). This is important because the changing image of the wolf coupled with the strong conservation ethic of the time gave rise to the anti-wolf control protests that persist today.

METHODS

Information for this study was collected from several sources, including published literature, personal interviews, and survey results. The questionnaire was a major source of data regarding the current controversy. The objectives of the survey were as follows:

a. To identify those aspects of wolf management where different public groups share common interests or goals;

b. To assess general levels of awareness among respondents regarding principles and practices of wolf management in British Columbia;

c. To identify specific communications and public relations needs based on perceptions and attitudes of respondents;

d. To identify the communications channels and information sources most used by respondents.

A copy of the questionnaire can be found in Appendix A.

SURVEY DESIGN

The survey instrument was a five page, mail-out questionnaire consisting of 35 fixed-alternative and three open-ended questions. There were 49 variables in total. I felt a better response rate would be achieved if respondents were assured of complete anonymity, hence there was nothing on the instrument or on the return envelope that could be used to identify respondents.

A mail-out survey was chosen for several reasons. First, a much larger sample could be surveyed by mail than by personal or telephone interviews because of the financial and time constraints on the study. In addition, many of the fixed-alternative questions may have been confusing if respondents were not able to read them first-hand. A mail-out survey also had the advantage of reducing interviewer bias because each respondent received the same set of questions, worded exactly the same way, and presented in the same order. When dealing with sensitive issues, mail-out surveys are often best because interpersonal reactions or emotions that may influence responses are avoided (Babbie 1979).

Fixed-alternative questions were used in the survey for two reasons: first, this format allows pre-coding of the questions and therefore quicker and easier analysis; and, secondly, fixed-alternative questions usually result in a greater response rate than open-ended questions on self-administered questionnaires (Bailey 1978). This is especially true for respondents with little education who may lack confidence in their ability to respond in writing.

SAMPLE

A stratified sample of interest groups was used for the survey. Special interest groups were chosen because the response rate and level of awareness on specific issues are usually greater among concern groups than among the general public (Bailey 1978). In addition, special interest groups have been most vocal on issues of wolf control in British Columbia.

Three major interest groups were surveyed, each with a different primary interest in the controversy: the British Columbia Cattleman's Association, the British Columbia Wildlife Federation, and the Federation of British Columbia Naturalists. Estimated membership within the three groups was 2500, 21 000, and 4500, respectively.

A sample of 100 respondents was drawn from the alphabetical membership list of each of the groups. Although sampling intensity differed between groups, 100 survey recipients were selected within each group to allow for non-responses and differential return rates. The samples were taken by systematically drawing names from the membership lists at fixed intervals as described by Siegel (1956).

IMPLEMENTATION

The content and structure of the questionnaire was reviewed by representatives from each of the interest groups to be sampled, as well as members of the British Columbia Fish and Wildlife Branch (Victoria) and two instructors from the Simon Fraser University Communications Department.

The questionnaire was pre-tested twice. In March 1981, an early draft of the survey instrument was tested by personally interviewing a sample of people in urban Vancouver. The second pre-test occurred in October 1981, when a draft was mailed to six respondents from the British Columbia Wildlife Federation and the Federation of British Columbia Naturalists. The purpose of these pre-tests was to determine the general levels of respondent awareness and comprehension of the questions.

On 1981 November 18, the final draft of the questionnaire was mailed out. Included with the questionnaire was a self-addressed envelope with pre-paid postage and a covering letter typed on Simon Fraser University stationery (Appendix B). A follow-up letter was mailed to all respondents on 1981 December 02 (Appendix C).

VERIFICATION AND ANALYSIS

The returned questionnaires were checked for completeness and the data read into the Simon Fraser University computer on keypunch cards. If respondents had checked two or more answers to a question where only one was requested, that question was considered spoiled and no response coded.

The Michigan Interactive Data Analysis System (MIDAS) was used to analyze the data. Frequencies and percentages were used to compare differences between groups and the significance of those differences determined by the non-parametric chi-square test for two independent samples. A significance level of .05 was used for all tests.

In those questions where a five-point scale was used, data were lumped into three categories for testing purposes. The 'agree' and 'strongly agree' responses were combined into one category, the 'disagree' and 'strongly disagree' into another, and the 'no opinion' responses into the third category. Lumping of the data before testing was necessary to ensure that no category contained less than five items. The 'no opinion' category was not included in the tests but is represented in frequency distribution results.

SURVEY RESULTS

THE SAMPLE

Of 300 questionnaires mailed, 228 were returned, for a response rate of 76%. One respondent was dropped from the sample because several of the socioeconomic questions had not been completed and it was impossible to classify the individual into any of the interest groups. The total number of usable questionnaires was therefore reduced to 227.

Many individuals failed to respond to the question regarding membership in a special interest group. There was no way of identifying individual respondents, so special interests were determined from answers to questions regarding livestock ownership and wildlife interest. The 78 respondents who said they own cattle or sheep in British Columbia were classified as livestock owners (Table 1). The remaining respondents were classified as hunters or non-hunters depending upon their wildlife interests (Table 2). Those who indicated hunting or trapping as a wildlife interest were considered consumptive users and included in the hunter category (answers to question 9 indicated that only five respondents actively trap in British Columbia). Assigning respondents to interest groups in this manner probably accounts for the response difference (Table 3) between hunters (N=50) and non-hunters (N=99) because some respondents who were members of the British Columbia Wildlife Federation but whose interest were fishing and not hunting, were included as non-hunters.

SOCIOECONOMIC CHARACTERISTICS

Most of the respondents were male (Table 4), which was expected because of the historical predominance of men in activities such as ranching and hunting. Female representation was greatest among non-hunters (36%), which is consistent with other studies of consumptive and 'non-consumptive users' (Fazio and Belli 1977).

With regards to age, the overall sample was mature (Table 5); only two respondents were under the age of 21. However, the age-class distributions between interest groups were quite different. Non-hunters had a relatively even distribution of respondents in each of the age classes over 21. The age-class distribution among stock owners was biased towards the middle (41-60) age group whereas the distribution for hunters was skewed towards the 21-40 year class.

There was a pronounced difference between groups with respect to formal education (Table 6). Post secondary education was characteristic of non-hunters, whereas hunters and livestock owners generally had less than Grade 12. This general trend has been found in other studies of consumptive and non-consumptive wildlife groups (Fazio and Belli 1977).

Results pertaining to respondents' place residence also revealed some important differences among interest groups. Ninety-four percent of stock-owners lived in rural areas whereas only 22% of hunters and 21% of non-hunters lived away from towns and cities (Table 7).

In all groups, most respondents were from south British Columbia but this locational bias was most apparent among non-hunters. Ninety-one percent of this group lived south of the Cariboo compared with 76% of hunters and 53% of livestock owners (Table 8).

LIVESTOCK DAMAGE: ECONOMIC SIGNIFICANCE

Only livestock owners perceived wolf damage as a serious economic threat to the beef industry in British Columbia (Table 9). The response difference between livestock owners and hunters ($P<.01$) and between livestock owners and non-hunters ($P<.001$) was significant. At the individual level (single ranch), all three interest groups agreed that damage could pose a serious threat although there was a considerable uncertainty amongst non-hunters (Table 10).

IMPACT OF PREDATORS ON UNGULATE POPULATIONS

Respondents in each of the interest groups rejected the proposition that wolves and bears were responsible for major declines in provincial ungulate populations (Table 11). Stock-owners and non-hunters also refused to accept that predators were responsible for local prey declines (Table 12). Hunters, however, were divided on this latter question; 45% agreed that predators were at fault and 43% disagreed. The response difference between hunters and non-hunters was significant ($P<.01$).

WOLF MANAGEMENT OBJECTIVES

The conservation of wolves in wilderness areas and the control of wolves in agricultural areas were regarded as equally important management objectives by most respondents from every interest group (Table 13). A substantial number of stock-owners and non-hunters, however, felt the two objectives were not of equal importance. Forty-one percent of stock-owners chose livestock protection as the more important objective while 41% of non-hunters chose wolf conservation.

When asked if one of the objectives was being given priority in the actual management of wolves, responses varied within and between groups, and many respondents expressed 'no opinion' (Table 14). The most frequent response (34%) by livestock owners was that wolves were being favoured. This result differed from that of hunters ($df=2$; $P<.01$) and non-hunters ($df=2$; $P<.01$) who perceived wolf control in agricultural areas as the management objective that was being given priority.

EFFECTIVENESS OF WOLF CONTROL

Most stock-owners (82%) and hunters (74%) felt there would be a significant increase in livestock losses if the current wolf control program were suspended (Table 15). Non-hunters were divided on this issue: 37% agreed losses would increase, 39% disagreed, and 25% had no opinion. The response differences between non-hunters and hunters ($P<.01$) were statistically significant.

WOLF CONTROL PROGRAM

Most respondents were aware of the Ministry of Environment's basic wolf control policy but they were ignorant or misinformed about compound 1080 and its use in wolf control. A majority of respondents from each interest group agreed that wolf control operations were directed towards problem wolves and not populations, which is the stated policy of the British Columbia Fish and Wildlife Branch (Table 16).

However, when asked whether compound 1080 was a non-specific poison, there was a very high frequency of 'no opinion' responses within each of the interest groups (Table 17). In every group, most respondents who did express an opinion thought that 1080 was a non-specific poison.

Similarly, most respondents from every interest group expressed ignorance when asked about the number of poison baits the Fish and Wildlife Branch was permitted to use annually for wolf control in British Columbia (Table 18). Most respondents with an opinion thought the Branch was not limited to 250 baits.

IMPACTS OF THE CONTROL PROGRAM

Many respondents also expressed ignorance when asked if the current use of 1080 for wolf control posed a severe threat to other wildlife populations

(Table 19). Fifty-two percent of non-hunters perceived 1080 as a significant threat to other wildlife.

Non-hunters (40%) also viewed the current wolf control program as a threat to the long term existence of wolves in British Columbia. Hunters and stock-owners did not share this opinion (Table 20), and the response differences between non-hunters and stock-owners ($P<.01$), and between non-hunters and hunters ($P<.01$) were statistically significant.

ALTERNATIVES

One alternative to a government-operated wolf control program is to let landowners deal with wolf problems themselves. Respondents from all groups agreed that such a scheme would result in greater destruction to wolves and other wildlife in British Columbia than the present system (Table 21).

Another alternative is to compensate stock-owners for livestock killed by wolves. Respondents overwhelmingly rejected this proposition when the costs of compensation exceeded those of wolf control (Table 22). When costs were the same, however, there was a difference of opinion between interest groups (Table 22). Non-hunters favoured such a program (61%) but hunters were opposed (66%). A test of this difference was significant ($P<.001$). Stock-owners were almost evenly split on this issue; 46% favoured compensation and 49% rejected it. Response differences between stock-owners and hunters ($P<.05$) and between stock-owners and non-hunters ($P<.02$) were also significant.

An open-ended question was included in the questionnaire to elicit respondents' ideas regarding alternatives to wolf control for the amelioration of livestock damage. Sixty-three responses were received. There were a variety of suggestions (Table 23), but the most frequent ($N=19$) was that livestock production should be discouraged in areas of marginal agricultural value where wolves are abundant. Twelve of the 19 respondents were non-hunters, two were stock-owners, and the remainder were hunters. Fifteen individuals, including five stock-owners, suggested that better animal husbandry practices should be encouraged on ranches. Another 15 respondents thought that wolf depredation could be reduced by ensuring that adequate populations of wild prey animals were available.

Respondents were also asked to describe methods of wolf control that they felt were more effective (Table 24) or more humane (Table 25) than those now in use. There were 23 responses to the former question, 20 to the latter. In both cases, relocation of problem wolves was the alternative most frequently suggested. Aversive conditioning was regarded the second most effective and humane alternative.

WOLF CONTROL TECHNIQUES: HUMANENESS

When asked to compare four wolf control techniques with regard to humaneness, all three groups thought leg-hold traps were the least humane of the control techniques listed (Table 26). Neck snares and 1080 were regarded

as more humane than leg-hold traps but much less humane than shooting. The most frequent response by livestock owners was that none of the techniques were inhumane. This response was the fourth most frequent amongst hunters and occurred with the least frequency of the five responses among non-hunters.

INFORMATION PATHWAYS

Newspapers and magazines were the major source of information about wildlife and wildlife management for respondents from all three interest groups (Table 27). Non-hunters also rely upon journals, books, and government publications for much information whereas stock-owners preferred verbal information sources including radio, television, and government employees. Excluding newspapers and magazines, no single information source was used with great frequency by hunters.

Table 1. Respondent profile - livestock ownership

Ownership	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
Yes	78	78	34
No	149	149	66
No response	0	0	0
Total	227	227	100

Table 2. Respondent profile - wildlife use[a]

Use	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
Hunting/Trapping	50	50	34
Reading about/ Viewing on T.V.	27	27	18
Observing/ Photographing	58	58	39
No interest	0	0	0
Other	14	14	9
No response	1[b]	0	0
Total	150	149	100

[a] Excluding stock-owners
[b] Excluded from the sample - unclassifiable into any group

Table 3. Respondent profille - interest groups

Interest	Absolute Frequency	Relative Frequency (%)
Livestock producer	78	34
Hunter	50	22
Non-hunter	99	44
Total	227	100

Table 4. Respondents' sex

Sex	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Female	12	12	15
Male	66	66	85
No response	0	0	0
Total	78	78	100
HUNTERS			
Female	3	3	6
Male	47	47	94
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Female	35	35	36
Male	63	63	64
No response	1	0	0
Total	99	98	100

Table 5. Respondent age

Age	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Under 21 years	1	1	1
21 - 40 years	16	16	21
41 - 60 years	45	45	59
Over 60 years	14	14	19
No response	2	0	0
Total	78	76	100
HUNTERS			
Under 21 years	0	0	0
21 - 40 years	22	22	45
41 - 60 years	19	19	39
Over 60 years	8	8	16
No response	1	0	0
Total	50	49	100
NON-HUNTERS			
Under 21 years	1	1	1
21 - 40 years	32	32	33
41 - 60 years	27	27	28
Over 60 years	36	36	38
No response	3	0	0
Total	99	96	100

Table 6. Respondent education levels

Education	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Under 12 years	35	35	45
Grade 12	19	19	24
Technical	6	6	8
Some university	10	10	13
University grad	8	8	10
No response	0	0	0
Total	78	78	100
HUNTERS			
Under 12 years	20	20	40
Grade 12	10	10	20
Technical	9	9	18
Some university	6	6	12
University grad	5	5	10
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Under 12 years	11	11	11
Grade 12	14	14	14
Technical	2	2	2
Some University	25	25	25
University grad	47	47	48
No response	0	0	0
Total	99	100	100

Table 7. Respondents' residence: rural, urban,city

Residence	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Rural	73	73	94
Urban	4	4	5
City	1	1	1
No response	0	0	0
Total	78	78	100
HUNTERS			
Rural	11	11	22
Urban	17	17	34
City	22	22	44
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Rural	21	21	21
Urban	20	20	20
City	58	58	59
No response	0	0	0
Total	99	99	100

Table 8. Respondents' residence: north or south British Columbia

Residence	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
North[a]	36	36	47
South[b]	41	41	53
No response	0	77	100
Total	78	77	100
HUNTERS			
North	12	12	24
South	38	38	76
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
North	9	9	9
South	90	90	91
No response	0	0	0
Total	99	99	100

[a] North: Cariboo and northern regions.
[b] South: mainland regions south of Cariboo, Vancouver Island.

Table 9. Responses to Question 24: Disturbance and loss of cattle due to wolves are serious economic threats to the beef industry in British Columbia

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	41	41	56
Disagree	25	25	34
No Opinion	7	7	10
No response	5	0	0
Total	78	73	100
HUNTERS			
Agree	14	14	28
Disagree	30	30	60
No Opinion	6	6	12
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Agree	5	5	5
Disagree	71	72	75
No Opinion	19	19	20
No response	4	0	0
Total	99	95	100

Table 10. Responses to Question 25: Damage to livestock by wolves poses a serious threat to some individual stock-owners in British Columbia

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	63	63	83
Disagree	7	7	9
No opinion	6	6	8
No response	2	0	0
Total	78	76	100
HUNTERS			
Agree	27	27	54
Disagree	14	14	28
No opinion	9	9	18
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Agree	35	35	35
Disagree	33	33	34
No opinion	31	31	31
No response	0	0	0
Total	99	99	100

Table 11. Responses to Question 19: Major declines in some provincial prey populations (deer, moose, elk, caribou, mountain sheep) are due largely to predation by bears and wolves

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	22	22	29
Disagree	45	45	58
No opinion	10	10	13
No response	1	0	0
Total	78	77	100
HUNTERS			
Agree	16	16	32
Disagree	29	29	58
No opinion	5	5	10
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Agree	10	10	10
Disagree	80	80	83
No opinion	7	7	7
No response	2	0	0
Total	99	97	100

Table 12. Responses to Question 20: Local declines in some prey populations are due largely to predation by bears and wolves

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	27	27	35
Disagree	42	42	55
No opinion	8	8	10
No response	1	0	0
Total	78	77	100
HUNTERS			
Agree	22	22	45
Disagree	21	21	43
No opinion	6	6	12
No response	1	0	0
Total	50	49	100
NON-HUNTERS			
Agree	19	19	20
Disagree	63	63	65
No opinion	14	14	15
No response	3	0	0
Total	99	96	100

Table 13. Responses to Question 33: In your personal opinion, do you feel one of these objectives is of greater importance than the other?

1. Maintenance of viable wolf populations in wilderness areas.
2. Wolf control in established livestock areas.

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Equal importance	39	39	51
No. 1 greater	4	4	5
No. 2 greater	31	31	41
No opinion	2	2	3
No response	2	0	0
Total	78	76	100
HUNTERS			
Equal importance	29	29	59
No. 1 greater	10	10	21
No. 2 greater	8	8	16
No opinion	2	2	4
No response	1	0	0
Total	50	48	100
NON-HUNTERS			
Equal importance	50	50	52
No. 1 greater	40	40	41
No. 2 greater	5	5	5
No opinion	2	2	2
No response	2	0	0
Total	99	97	100

Table 14. Responses to Question 34: Do you think that one of these objectives is receiving priority in the current management of wolves in B.C.?

1. Maintenance of viable wolf populations in wilderness areas.
2. Wolf control in established livestock areas.

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Equal priority	19	19	25
No. 1 favored	26	26	33
No. 2 favored	12	12	15
No opinion	20	20	27
No response	1	0	0
Total	78	77	100
HUNTERS			
Equal priority	14	14	29
No. 1 favored	6	6	12
No. 2 favored	19	19	39
No opinion	10	10	20
No response	1	0	0
Total	50	49	100
NON-HUNTERS			
Equal priority	7	7	7
No. 1 favored	2	2	2
No. 2 favored	48	48	49
No opinion	41	41	42
No response	1	0	0
Total	99	98	100

Table 15. Responses to Question 22: Without a control program in ranching areas, many more wolves would begin to prey upon livestock

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	63	63	82
Disagree	8	8	10
No opinion	6	6	8
No response	1	0	0
Total	78	77	100
HUNTERS			
Agree	37	37	74
Disagree	10	10	20
No opinion	3	3	6
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Agree	36	36	37
Disagree	38	38	39
No opinion	24	24	24
No response	1	0	0
Total	99	98	100

Table 16. Responses to Question 21: When wolves are a confirmed problem, the policy of the Fish and Wildlife Branch is to control the problem animals, not the population

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	53	53	69
Disagree	17	17	22
No opinion	7	7	9
No response	1	0	0
Total	78	77	100
HUNTERS			
Agree	34	34	70
Disagree	9	9	18
No opinion	6	6	12
No response	1	0	0
Total	50	49	100
NON-HUNTERS			
Agree	49	49	50
Disagree	24	24	25
No opinion	24	24	25
No response	2	0	0
Total	99	97	100

Table 17. Responses to Question 27: 1080 is a non-specific poison having an equally strong effect upon all animals that consume it

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	32	32	42
Disagree	12	12	16
No opinion	32	32	42
No response	2	0	0
Total	78	76	100
HUNTERS			
Agree	16	16	33
Disagree	7	7	15
No opinion	25	25	52
No response	2	0	0
Total	50	48	100
NON-HUNTERS			
Agree	44	44	45
Disagree	18	18	18
No opinion	37	37	37
No response	0	0	0
Total	99	99	100

Table 18. Responses to Question 26: The maximum number of individual poison wolf baits that may be set out in one year by the Fish and Wildlife Branch is 250

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	9	9	12
Disagree	28	28	37
No opinion	39	39	51
No response	2	0	0
Total	78	76	100
HUNTERS			
Agree	6	6	12
Disagree	11	11	23
No opinion	31	31	65
No response	2	0	0
Total	50	48	100
NON-HUNTERS			
Agree	3	3	3
Disagree	20	20	21
No opinion	73	73	76
No response	3	0	0
Total	99	96	100

Table 20. Responses to Question 18: Do you feel that the present level of wolf control by the Fish and Wildlife Branch poses a serious threat to the long-term existence of wolves in British Columbia?

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Yes	9	9	12
No	53	53	68
No opinion	16	16	20
No response	0	0	0
Total	78	78	100
HUNTERS			
Yes	10	10	20
No	28	28	56
No opinion	12	12	24
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Yes	39	39	40
No	29	29	30
No opinion	29	29	30
No response	2	0	0
Total	99	97	100

Table 19. Responses to Question 28: The present use of 1080 by the Fish and Wildlife Branch for wolves is a major threat to other wildlife in British Columbia

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	17	17	22
Disagree	30	30	40
No opinion	29	29	38
No response	2	0	0
Total	78	76	100
HUNTERS			
Agree	19	19	38
Disagree	10	10	20
No opinion	21	21	42
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Agree	51	51	52
Disagree	18	18	18
No opinion	29	29	30
No response	1	0	0
Total	99	98	100

Table 21. Responses to Question 29: If wolf control were left to the individual landowners rather than the Fish and Wildlife Branch, a greater threat to wolves and other wildlife would result than from the present program

	Absolute Frequency	Adjusted Frequency	Relative Frequency (%)
LIVESTOCK OWNERS			
Agree	39	39	52
Disagree	31	31	41
No opinion	5	5	7
No response	3	0	0
Total	78	75	100
HUNTERS			
Agree	33	33	66
Disagree	13	13	26
No opinion	4	4	8
No response	0	0	0
Total	50	50	100
NON-HUNTERS			
Agree	65	65	66
Disagree	12	12	12
No opinion	22	22	22
No response	1	0	0
Total	99	99	100

Table 22. Responses to Question 30 and 31: Would you favour a compensation program if the costs were: 1. greater than, or 2. the same as those of controlling wolves in agricultural areas?

	Absolute Frequency		Adjusted Frequency		Relative Frequency (%)	
	greater	same	greater	same	greater	same
LIVESTOCK OWNERS						
Yes	18	35	18	35	24	46
No	51	37	51	37	68	49
No opinion	6	4	6	4	8	5
No response	3	2	0	0	0	0
Total	78	78	75	76	100	100
HUNTERS						
Yes	5	11	5	11	10	22
No	40	33	40	33	80	66
No opinion	5	6	5	6	10	12
No response	0	0	0	0	0	0
Total	50	50	50	50	100	100
NON-HUNTERS						
Yes	27	60	27	60	28	61
No	53	28	53	28	56	28
No opinion	15	11	15	11	16	11
No response	4	0	0	0	0	0
Total	99	99	95	99	100	100

Table 23. Responses to Question 36: Do you feel there is another remedy to the wolf livestock problem other than controlling wolves?

Alternatives	Livestock Owners	Hunters	Non-Hunters	Total
Compensation for stock losses	2	0	4	6
Discourage grazing in marginal areas	2	5	12	19
Develop better animal husbandry	5	2	8	15
Ensure adequate natural prey	8	1	6	15
Ranchers should accept losses	0	1	2	3
Do more research	1	1	2	4
Use dogs to protect stock	0	0	1	1
Total	18	10	35	63

Table 24. Responses to Question 37: Do you know of any more effective techniques for managing wolves other than shooting, trapping, or poisoning?

Techniques	Livestock Owners	Hunters	Non-Hunters	Total
Aversive conditioning	1	0	4	5
Mechanical devices	0	0	1	1
Reproductive control	1	0	0	1
Relocation	3	3	3	9
Adequate prey	1	0	3	4
Scent marking with wolf urine	0	0	1	1
Bounty on wolves	0	1	0	1
Den hunting	1	0	0	1
Total	7	4	12	23

Table 25. Responses to Question 38: Do you know of any other techniques for managing wolves that are equally effective as shooting, trapping, or poisoning but that you feel are more humane?

Techniques	Livestock Owners	Hunters	Non-Hunters	Total
Aversive conditioning	2	1	4	7
Relocation of problem wolves	1	3	5	9
Reproductive control	0	1	0	1
Better poisons	1	1	1	3
Total	4	6	10	20

Table 26. Responses to Question 32: Assuming that a wolf must be removed from the population, and that all methods are carried out by concerned and experienced professionals, are there any of the following control methods that you consider to be grossly inhumane?[a]

Techniques	Livestock Owners	Hunters	Non-Hunters	Total
Shooting	8 (7%)	7 (8%)	7 (3%)	22 (5%)
Leghold trap	30 (27%)	28 (32%)	81 (35%)	139 (32%)
Neck snare	21 (19%)	20 (22%)	66 (29%)	107 (25%)
Poison (1080)	14 (13%)	20 (22%)	70 (30%)	104 (24%)
None of these methods are grossly inhumane	32 (29%)	12 (13%)	4 (2%)	48 (11%)
No opinion	5 (5%)	3 (3%)	3 (1%)	11 (3%)
Total	110 (100%)	90 (100%)	231 (100%)	431 (100%)

[a]Respondents permitted to check more than one response.

Table 27. Responses to Question 13: From the list below indicate the sources through which you most often get information regarding wildlife or wildlife management in B.C.[a]

Information Sources	Livestock Owners	Hunters	Non-Hunters	Total
Radio, T.V.	33 (22%)	13 (12%)	36 (12%)	82 (15%)
Newspapers, magazines	37 (24%)	34 (32%)	72 (23%)	143 (25%)
Journals, books	17 (11%)	11 (11%)	66 (22%)	94 (17%)
Friends, neighbours	14 (9%)	11 (11%)	26 (8%)	51 (9%)
Government employees	25 (16%)	14 (13%)	35 (11%)	74 (13%)
Government publications	19 (13%)	15 (14%)	52 (17%)	86 (15%)
Other	7 (5%)	7 (7%)	20 (7%)	34 (6%)
Total	152 (100%)	105 (100%)	307 (100%)	564 (100%)

[a]Respondents permitted to check more than one response.

DISCUSSION

The current wolf control controversy is a complex mesh of issues and players. However, special interest groups are the key participants and the actions of these groups are the basis for much of the controversy. Their actions are important as they relate to other interest groups and to the government agencies charged with wildlife management in British Columbia.

Special interest groups tend not to be very tolerant of one another. Relations are often strained, with environmentalists being labelled as 'do-gooders' and hunters and ranchers as 'red-necks'. The disagreements between groups reflect some significant differences in perceptions and attitudes. Unfortunately these differences are so emphasized that often common interests are obscured, which contributes to adversarial role-playing and entrenchment of group positions.

LIVESTOCK PROTECTION

Much of the controversy concerns the control of wolves for the protection of domestic livestock. Traditionally, predator control was regarded as a necessary tool to keep the livestock industry viable. However, the significance of predator-related damage to the industry has come into question and some critics of the wolf control program charge that stockmen are at fault for their own losses.

Damage

Data regarding livestock losses to wolves in western Canada indicate that although individual operations may suffer severe losses, damage is low on an industry-wide basis. Based on questionnaire responses from ranchers in the Skeena region of British Columbia, Hatler (1981) found that 'known' plus 'suspected' wolf kills accounted for a loss of much less than 1% of the total cattle on the range (Table 28). Furthermore, about 60% of the ranchers responding to Hatler's questionnaire suffered no predator-related losses at all.

Despite the industry figures, wolf predation can pose a significant threat to some individual cattle operations (Tompa 1983b). Results from a study in northwestern Alberta showed that wolf kills of cattle were as high as 8% on some grazing leases without wolf control (Bjorge and Gunson 1981). Similarly, Hatler (1981) described one rancher near Topley, B.C., who, in 1980, lost 43 cattle from a herd of 142 to wolves and other causes.

Table 28. Wolf-related livestock losses in the Skeena region (adapted from Hatler 1981)

Year	Total Stock	Wolf Kills		Total	% of Total Stock
		Known	Suspected		
1974	19 131	35	94	129	0.67
1975	20 129	44	12	56	0.28
1979	12 884	39	28	67	0.52
1980	11 985	9	50	59	0.49

Persons outside the cattle industry recognize that wolf damage is a potential threat to some individual ranchers. Survey results, however, demonstrate that non-ranchers do not perceive wolf predation as a major threat to the beef industry. Claims made by the Cattlemen's Association (Robinson 1980) that if the wolf problem is not solved soon, British Columbia consumers will face a meat shortage, are viewed as propaganda and consequently the demands by beef producers for increased wolf control are opposed.

The perception of many stock-owners that the cattle industry is threatened most probably results from their awareness of the high losses suffered by some producers, coupled with the uncertainties of wolf predation and the marginal economic status of many British Columbia operations. As expressed by Hatler (1981), "Yet some individual ranchers suffer losses, to the extent that their experience looms as a threat to others...".

Land Use

Most of the complaints about wolf-related livestock damage originate from the north and central parts of British Columbia. In these areas, wolves are abundant and ranches often exist as 'islands' in the expanse of boreal forest (Hatler 1981). Because of the known wolf problem, continued encouragement of agricultural expansion in the north is opposed by numerous people, including many biologists with the Fish and Wildlife Branch (pers. comm.).

Several respondents commented on this situation and some assigned fault to ranchers for raising cattle in 'wolf country'. Whether northern British Columbia is 'wolf country' or 'cattle country' depends upon ones' perspective, but the comments of these respondents indicate that there is significant opposition to agricultural expansion in British Columbia if it is at the expense of wildlife.

Animal Husbandry

A factor that significantly affects the susceptibility of livestock to wolf predation is animal husbandry. Failure to remove dead animals from the range, grazing cattle near heavily forested areas, and allowing cattle to calve away from supervised locations are practices that increase the probability of wolf attacks (Hatler 1981; Bjorge and Gunson 1981; Tompa

1983b). The likelihood of attack is further increased when cattle are released unguarded onto open (unfenced) range for long periods of time, a common practice on some ranches in British Columbia during the summer.

The reasons for poor husbandry include apathy, ignorance, and economics. Regardless of the causes though, survey results showed that many respondents are aware of this problem and attribute wolf-related losses to such management.

The impacts of this are twofold. First, the awareness among 'non-ranchers' of sloppy livestock management stimulates opposition to industry demands for increased predator control. Second, it reflects badly on the industry as a whole, including those ranchers who run clean operations. Evidence of resentment by this latter group of cattlemen was apparent from some open-ended and unsolicited comments on the questionnaire.

The current wolf control policy of the Fish and Wildlife Branch requires that livestock damage claims be investigated for evidence of poor husbandry before control measures are taken (Tompa 1983a). This prevents the implementation of wolf control in some cases where livestock has been improperly managed. However, the Ministry of Agriculture does not require that any particular level of husbandry standards be maintained (F. Harper, pers. comm.). Consequently, decisions are left to the discretion of the investigating field officer who must make a subjective evaluation of the situation when a damage claim is made.

RECOVERY OF DECLINING UNGULATE POPULATIONS

Another aspect of wolf management that has stimulated much public controversy in British Columbia has been the proposal to control wolves for the benefit of depressed prey populations. In these situations, preventative control may be required.

The Fish and Wildlife Branch has proposed intensive control for two areas, one in northern British Columbia and another on northern Vancouver Island. In both areas, there was evidence indicating that wolf predation was significant in the decline of particular ungulate populations and these projects were intended to provide information regarding local predator/prey relationships (D. Eastman, pers. comm.). Many hunters supported these proposals but some environmentalists were bitterly opposed.

Aside from the use of poisons, which is a separate issue, there are two major disputes. The first is whether wolf predation is a significant factor in the decline of ungulate populations and the second is the choice of management alternatives that should be implemented.

Reasons for Declines in Ungulate Populations

Ungulate mortality is the result of many factors. Wolf predation is one cause. There is also predation by other carnivores, hunting, accidents, starvation, disease, and habitat destruction by man.

Whether wolves have the capability to regulate their prey is the subject of much scientific debate and a growing body of evidence indicates that the

impacts of predation vary with several factors, including snow depth and the availability of alternate prey species. Connolly (1978) cites evidence for both sides; in some instances, prey populations seem unaffected by wolf predation; in others, the prey has been decimated. Allen (1979) describes similar results for Isle Royale over a 20-year period. During the first 10 years, both wolves and moose were plentiful, but the heavy snows of the 1970's altered that relationship in favour of the wolf.

It is increasingly apparent that relationships between wolves and their prey vary at the local level. As a result, it is difficult to generalize about the impacts of wolves on ungulates, even within the boundaries of British Columbia. The size and ecological diversity of this province create many differences with respect to environment, species composition, and abundance. In addition, there are regional differences in resource development and environmental management that further complicate the situation.

The interest groups surveyed have differing perceptions of the impacts of wolf predation on regional ungulate populations. From open-ended and unsolicited comments on the questionnaire, it was apparent that non-hunters regarded habitat loss and overhunting as the major causes of ungulate declines. A survey of the general public in 1981 produced similar results (Self 1981). In this latter survey, habitat conservation and reduced hunting pressure were identified by respondents as the most significant wildlife needs in British Columbia (Self 1981). In discussing the attitudes of respondents, Self (1981) states, "As the general population see fewer wildlife in their recreational environments, hunting will be increasingly (although erroneously) pinpointed as the primary cause."

Hunters also recognize the importance of habitat to ungulate survival but survey results indicate that the wolf is perceived as a major factor in many local prey declines. Results from the Tsitika watershed, where hunting and resource development were absent, indicate that the wolf may have been the principle cause of deer declines on northern Vancouver Island (D. Hebert, pers. comm.). Thus, hunters may have a realistic perception of the northern Vancouver Island situation but whether the same is true for other parts of British Columbia is uncertain.

This uncertainty is a major factor in the continuing debate. At present, the lack of data regarding wolf-ungulate relationships in British Columbia, coupled with the multiplicity of factors regarding ungulate populations, permits equally valid arguments to be made for and against the wolf as the major cause of local prey declines.

Management Options for Recovery Assistance

The simplest method of assisting the recovery of prey populations is to reduce mortality from predation, assuming it is the limiting factor. Most ungulate populations in British Columbia are preyed upon by natural predators and by man. The management options, therefore, involve a reduction in one or both of these sources of mortality and this choice is the source of much disagreement between hunters and non-hunters. Among the natural predators, the wolf is chosen as the central target for control because it is abundant and has a very high reproductive potential, unlike predators such as the

grizzly.

Hunters have been the most vocal advocates of wolf control for the benefit of prey species. Their support of preventative wolf control is based upon two factors. First, they perceive the wolf as a major cause of local prey declines. Second, they wish to maintain the ungulate resource at a level sufficient to support their recreational pursuits.

Environmental groups provide the greatest opposition to the hunters' demands. This opposition originates from their disbelief that the wolf is the primary cause of ungulate declines and their philosophy that hunters should be removed from the system before the wolf. Hunters regard this latter proposal as unjust because they support the management of the wildlife resource through the payment of licence fees.

This conflict between hunters and environmentalists illustrates the longstanding rift between the two groups. The separation between them is most unfortunate as it prevents them from working together for wildlife, which is ultimately their common goal.

WOLF MANAGEMENT PROGRAM

The wolf management program has been the target of much criticism and disagreement in British Columbia. Much of that disagreement results from differing perceptions of the impacts of wolf control and the humaneness of the control techniques. In addition, some critics charge that all the alternatives to lethal control have not been given sufficient consideration.

Impacts

The use of compound 1080 is a major issue in the controversy. Excepting livestock owners, many respondents perceive a major threat to other wildlife from the use of 1080 in the current wolf control program.

Some non-target poisonings do occur. However, the selective properties of compound 1080 and the restrictions in the current pesticide permit limiting use to a maximum of 5 g per year for the entire province make the probability of such a large scale threat to wildlife exceedingly low.

Perceptions of this 1080 threat may be attributed to a general lack of awareness. As shown by survey results, awareness of the properties of this poison and the restrictions on its present use are very poor. In addition, much of the information about 1080 carried by the news media is based on the historical abuse of this pesticide, which caused widespread destruction of non-target species in Canada and the United States. Unfortunately, the differences between these historical programs and the present use for wolf control in British Columbia are rarely publicized.

That stockmen do not perceive the same threat to wildlife from 1080 as other respondents presumably results from their closer involvement with wolf control. Government employees are responsible for the preparation and placement of 1080 baits, but some requests for wolf control come from livestock owners. This first-hand contact and residence in the vicinity if baiting permits them insight into the wolf control program that few urbanites

have.

Questionnaire results revealed that some respondents, primarily non-hunters, perceived the current wolf control program as a threat to the long-term existence of the wolf in British Columbia. Such perceptions are the result of a lack of awareness of the current program, a basic distrust of the Fish and Wildlife Branch, and sometimes government in general, or a fear that the poisoning program in combination with harvesting and other resource development activities is more than existing wolf populations can withstand.

The current program is unlikely to threaten the future existence of the wolf in British Columbia for the following reasons. First, the current program destroys far fewer wolves than the prophylactic measures of the 1950's, which most wolf populations in this province survived (Preliminary Wolf Management Plan for British Columbia 1979). Second, wolf populations in many areas are growing (Preliminary Wolf Management Plan for British Columbia 1979; Tompa 1983a) despite maintenance of the current reactive control program and other resource development pressures.

Part of the problem is a lack of faith in the estimates of wildlife populations by the Fish and Wildlife Branch. Referring to the Vancouver Island situation, Patrick Moore, president of Greenpeace Canada, was quoted in the Vancouver Sun (Farrow 1980) as saying, " We believe the Branch is exaggerating the number of wolves on the Island. The Branch has no accurate counts."

Under the best of circumstances, wolf populations are difficult to survey and it is well known that the Fish and Wildlife Branch has limited resources to perform such work. As a result, regional population estimates are based upon a variety of information sources, including prey and habitat distributions, employee observations, damage complaints, research results, and sighting reports by the public (Preliminary Wolf Management Plan for British Columbia 1979; D. Hebert, pers. comm.). Although there may be a considerable degree of error in some estimates, relative comparisons are still possible and these comparisons indicate that some wolf populations in British Columbia have greatly increased in the past 15 years (D.Hebert, pers. comm.).

Humaneness of Wolf Control

Humaneness is a very important aspect of predator control. This is apparent from the protests of various individuals and groups such as the Association for the Protection of Fur-bearing Animals. In the United States, a study of public attitudes towards coyote control showed humaneness to be the single most important factor determining the acceptability of control techniques (Stuby et al. 1979).

Determination of humaneness is a subjective and very personal decision, dependent upon individual values. Any death that is not immediate and painless can be considered inhumane to some degree. Many people evaluate humaneness in this context, although unsolicited responses indicate that stockmen take a somewhat different view. Several ranchers commented that the control methods used against wolves cause much less suffering than wolves cause to their prey, which may explain the response by many stock-owners that none of the wolf control techniques was inhumane.

It is apparent that perceptions regarding humaneness vary relative to the criteria that are applied and this provides some explanation of the different attitudes expressed by stockmen and environmentalists. Whereas environmentalists view humaneness in terms of the absolute degree of suffering, many stockmen draw comparisons between the suffering endured by wolves and suffering caused by them.

Alternatives

The lethal control of wolves is not the only management option available for resolving the livestock damage problem in British Columbia. A number of other biological and economic alternatives are possible.

Among the economic alternatives, compensation for losses is the most frequent suggestion. The apparent advantage of this method is that the demands of stockmen can be fulfilled without destroying wolves. Such a management strategy is particularly attractive to environmentalists, as indicated by the survey responses from non-hunters.

Unfortunately, there are some drawbacks associated with this sort of compensation program. The first is cost. Respondents indicated that such a system would be acceptable only if the costs did not exceed those of the current wolf control program. It is uncertain whether such conditions could be met, particularly if wolf control measures were completely withdrawn. Presently, there are no livestock compensation programs in North America that are not accompanied by some form of predator control (F. Tompa, pers. comm.).

The second major drawback is the acceptability of such a program to livestock producers. Although compensation for losses would appear to be in stockmen's best interests, survey results showed that many ranchers do not support this proposal.

The misgivings of stockmen are based on a number of factors. First, indemnification for stock losses is unlikely to be at full market value, as this would be a disincentive to good animal husbandry. Under the current compensation program in Alberta, payment is at 80% of market value.

Second, only proven predator damage would be reimbursed and determination of the cause of death is often difficult. Livestock die of a variety of causes and often the carcasses are not found or have been scavenged upon before discovery. Consequently, some losses could go uncompensated.

In addition, damage to livestock as the result of behavioural disturbance (harassment) from wolves could not be considered for compensation because of the difficulties in proving a cause-effect relationship and quantification of the losses. This dilemma is apparent from the comments of one rancher who participated in Hatler's wolf-livestock study in the Skeena region, "He said although the compensation covered livestock kills, it didn't cover other effects predators have on cattle. He said calf and cattle weights were down and he felt that predator activity was responsible." (The Smithers Interior News 1981).

Third, if wolf control were eliminated, ranchers fear that wolf-related livestock damage would increase. In light of the previous two problems, this

would contribute to an increasing financial loss for stockmen, despite compensation.

Another economic alternative to wolf control is the establishment of an insurance program for predator-related losses. Stanley Cain (1971), the chairman of a commission of inquiry into predator control in the United States, and Hatler (1981), who conducted the wolf/cattle study in the Skeena region, both suggested some form of insurance program be considered. The Cain Commission (1971) regarded insurance preferable to compensation because the former "encourages self-reliance in the industry." However, Cain (1971) points out that, "Even with a uniform rate, only high risk ranchers would tend to participate." Since the majority of stockmen do not suffer high predator-related losses, such a program might be troubled by a lack of participation. Nevertheless, the commission developed a set of conditions that they felt would remedy most of the problems inherent in a livestock insurance program of this sort. They are as follows:

1. That a large number of livestock within any state probably would have to be covered;

2. That losses from all causes would have to be covered because of the impracticality in most cases of determining and validating the actual cause of death;

3. That the industry should accept some loss as part of doing business and that as a consequence only excessive losses would be covered; and

4. That it would be a participating program with livestock growers.

Aside from these economic strategies, relocation and aversive conditioning are popular alternatives to lethal wolf control. However, like the economic, there are many problems associated with these techniques. Aversive conditioning is a behavioural modification technique intended to prevent predators from attacking livestock. The simplest field application of this technique is to inject a bait animal such as a cow or sheep with a noxious substance and set the carcass out where predators will feed upon it. Lithium chloride is a commonly used chemical. Feeding upon the carcass causes the scavenging animal to become ill. The animal soon learns to associate this illness with the bait animal and is theoretically conditioned against feeding upon or killing any members of that species.

Although some of the early research showed promise (Gustavson 1979), the technique has not been effective in the field (Conover 1982). Experiments with coyotes (Conover 1982) revealed one of the major problems with the baiting method; some predators were conditioned to avoid carrion, not to stop killing domestic livestock. Since carrion is a significant part of the diet of most wolves and coyotes (Young and Jackson 1951; Mech 1970), avoidance of this food source may force these predators to kill more often (Conover 1982). As a result, the damage problem may be made worse, not better. There are many variations on the baiting procedures but none have been proven sufficiently effective to warrant use in existing programs (F. Tompa, pers. comm.).

Relocation of problem wolves is another attractive yet impractical alternative to wolf control. This technique requires that wolves be humanely trapped and shipped to wilderness locations.

There are five major problems with this method. First, wolves are very difficult to trap. Second, as wolves can travel long distances, they would have to be shipped a long way to prevent them from returning, which would be very costly. Third, shipment of wolves to another area might amount to a translocation of the problem. Fourth, movement of animals from one area to another might result in the transmission of disease or parasites. Lastly, since wolves are territorial and kill intruders, placement of problem wolves in a different location might be equivalent to lethal control.

All the alternatives to lethal wolf control have serious drawbacks. However, the current control is not without problems and although most respondents feel that stock losses would be considerably higher without it, the economic effectiveness of the program has never been tested. Such an evaluation requires that the value of the stock saved be compared to that of the costs of control (Cain 1971). Such a comparison is extremely difficult because of the number of variables involved, a lack of information regarding livestock losses without control, and difficulties in quantifying some of the costs and benefits.

As long as the program remains untested, however, it is unproven. Consequently, it is open to question whether the current practice of lethal control is the optimal management strategy for ameliorating livestock damage. Despite the obvious drawbacks of the alternatives, it is possible that some are no worse than the current control program.

POINTS OF CONSENSUS

Despite many differences between interest groups there is general agreement on some fundamental aspects of wolf management. These points of consensus are all matters of basic principle or general perception.

Livestock Protection

All three interest groups surveyed regarded the maintenance of wolves in wilderness areas and the control of wolves in established agricultural areas as equally important management objectives. This is an indication that the British Columbia Ministry of Environment has considerable public support for its management philosophy. Furthermore, it shows that in spite of conflicting interests, there is basic acceptance by interest groups of the need for compromise. Although livestock owners want government assistance with predation problems, they do not advocate the total eradication of wolves. Similarly, the conservation aims of environmentalists are tempered by the realization that in some cases wolf damage to livestock is sufficient to warrant control. Public support for predator control in livestock areas was evident from an earlier survey by Self (1981) as well.

Ungulate Declines

The wolf may be the principle cause of some local prey declines in British Columbia but few respondents blame it for general ungulate declines in

this province. This response indicates widespread recognition that there are factors impacting the wildlife resource other than wolves. That the general public is aware of man's impacts on wildlife was also demonstrated by Self's (1981) survey results.

Wolf Control Program

Notwithstanding the criticism of the current wolf control program, interest groups are agreed that it is less damaging to wildlife than leaving landowners to manage their own predator problems. This response is acknowledgment that the program has some positive value for wildlife in British Columbia. It also shows that interest groups recognize there are non-quantifiable benefits associated with the current program.

Compensation As An Alternative

Respondents from all groups were concerned that any compensation program considered as an alternative to wolf control should be cost-effective. Even non-hunters, who favoured the compensation proposal when costs equalled those of wolf control, rejected it when costs were higher.

As well as cost-effectiveness, there may be another variable affecting public attitudes towards compensation. A survey of the general public in the United States showed cost to be less important than humaneness and specificity in determining the acceptability of coyote control methods, yet indemnity payments to ranchers were less acceptable than some lethal control methods (Arthur 1981). Arthur (1981) speculates that, "...subsidy and indemnity payments may call forth another dimension of acceptability independent of cost, humaneness, and specificity."

Humaneness Of Control Methods

Perceptions of the relative humaneness of predator control techniques seem to be independent of the special interests of respondents. All three groups surveyed chose shooting as the most humane and leg-hold traps as the least humane methods of control. Poison (1080) rated slightly better than traps. This selection was identical to that made by American respondents in a survey of public attitudes towards coyote control (Stuby et al. 1979).

The length of time required to kill the animal is apparently a major factor in respondents' perceptions of humaneness. This is evident from the overall scale of preference indicated by respondents and from the American study (Stuby et al. 1979) where respondents rated fast-acting poisons as much more humane than slow poisons. This time element may underlie much of the opposition to 1080, which is a relatively slow-acting poison.

PUBLIC RELATIONS: MANAGEMENT AGENCIES AND EXTERNAL PUBLICS

The British Columbia Ministry of Environment and specifically the Fish and Wildlife Branch are an integral part of the wolf management controversy. The Branch is the government agency charged with managing British Columbia's wildlife. As such, its policies are the focus of much public criticism.

With a management issue as broad and as emotionally sensitive as wolf

control, it is impossible for any agency to satisfy all public interest groups completely. However, good public relations are essential to minimizing conflict. At present, a significant public relations problem hinders cooperation between public interest groups and the Fish and Wildlife Branch. That problem is a lack of effective two-way communication.

Communication

Successful two-way communication requires that a management agency listen as well as disseminate information (Fazio and Gilbert 1981). To accomplish this, the agency must be accessible and receptive to reasonable public input.

Currently, in British Columbia, the only established vehicle for public input into wolf management issues is through the Problem Wildlife Management Advisory Committees. The membership of the provincial committee is as follows:

Ministry of Agriculture	2 members
Ministry of Environment	2 members
B.C. Cattlemen's Association	1 member
B.C. Federation of Agriculture	1 member
B.C. Federation of Naturalists	1 member
B.C. Wildlife Federation	1 member

The committees are not a forum for expression of general wildlife concerns by any member of the public and the makeup of the committees is such that some environmentalists feel that agricultural and consumptive wildlife interests are overrepresented (G. Clements, N. Minunzie, pers. co[illegible]. Furthermore, the committees convene only when there is a specific problem to be addressed. As a result, many interest groups voice their concerns through other available channels. They typically revert to the news media, which as survey results showed is a major source of information regarding wildlife for people from all groups. Interest groups also attempt to influence the decision-making process through political lobbying. Unfortunately, both these methods exacerbate the controversy by contributing to the adversarial atmosphere and the proliferation of misinformation.

Public support or at least public sufferance is necessary before wildlife management can function (Schoenfeld 1957). That the wolf management controversy persists is evidence that this sufferance is lacking among some publics in British Columbia. This points to a need for improved public relations by the Ministry of Environment and such change is dependent on the establishment of effective two-way communications.

CONCLUSIONS

As Schoenfeld (1957) stated, "Quite as much as the management of game itself, wildlife management involves human factors." Nowhere is this more apparent than with wolf management in British Columbia. Public opinion has significantly affected wolf management policy in this province and stands to play an even greater role in the future as demand for limited resources increases.

THE WOLF AND CHANGING SOCIAL VALUES

The public controversy regarding wolf management has grown as a consequence of increased environmental awareness and changing attitudes towards the wolf. Advances in communications technology have helped to facilitate this change. That the wolf is the focal point of the controversy is significant, for no other animal evokes such strong emotion in people. The polarization of attitudes typical of the current debate is a reflection of these powerful emotions.

INTEREST GROUPS

Special interest groups represent the most significant source of public pressure regarding wolf management in British Columbia. Comparisons show that respondents' perceptions and attitudes differ along with special interests and these differences are the basis for much of the strife between groups. Nevertheless, there is consensus among groups on some important aspects of wolf management.

Livestock Protection

Lethal control of problem wolves in established agricultural areas is widely accepted as a legitimate aspect of wolf management. Most people realize that wolf-related damage can be very significant to individual ranchers. However, people outside the livestock industry do not perceive wolf predation as a serious threat to the economic viability of the beef industry and are unwilling to support expanded control activities beyond the current reactive program. Although many ranchers want prophylactic wolf control in ranching areas, they do not advocate destruction of wolves in wilderness areas.

Compensation for wolf-related livestock damage is an acceptable alternative to lethal wolf control only if it is cost-effective. Respondents from all interest groups are against a compensation program if costs are greater than wolf control and many stockmen are strictly opposed to any alternative that means termination of control measures.

Assistance of Ungulate Populations

Preventative wolf control for the benefit of ungulate populations is unacceptable to non-hunters in British Columbia. They do not perceive the wolf as the primary cause of ungulate declines, even at the local level. In addition, non-hunters object to the removal of wolves

without prior elimination of hunting. This issue is complicated by variation in the significance of wolf predation in local ungulate declines and the degree of uncertainty in Fish and Wildlife Branch estimates of wildlife populations in British Columbia.

Wolf Control Program

There is a very low level of public awareness regarding the Ministry of Environment's wolf control operations in British Columbia. It is generally recognized that the control program is directed towards individual problem wolves but there is much ignorance and misinformation about 1080 and its use for wolf control. Despite this, people perceive that the damage to wildlife would be greater if government control activities were suspended because wolf control by private citizens would increase.

Humaneness is an important determinant of public acceptability of lethal control techniques and there is a public preference for quick-killing methods. Shooting is perceived as vastly more humane than slow poisons, snares, or leg-hold traps. There is an attraction to non-lethal methods of wolf control but there are numerous problems with these methods at present.

PUBLIC RELATIONS

The Ministry of Environment, as the management agency responsible for wildlife in British Columbia, is an important part of the wolf management controversy. The ineffective two-way communication between the Ministry and its external publics has contributed to the adversarial nature of the controversy and the proliferation of misinformation. Improved public relations by the Ministry of Environment are necessary to reduce the social conflict and stimulate a more favourable climate of public opinion.

CONCLUSION

The public controversy over wolf control in British Columbia shows the intense concern people have in the management of Canis lupus. The wolf issue also shows the diversity of interests that are involved and above all illustrates the importance and complexity of social concerns in wildlife management.

RECOMMENDATIONS

Wolf management will remain a controversial issue in British Columbia but some of the current adversity between special interest groups and opposition to government could be reduced if the Ministry if Environment were to improve public relations and expand its research program. Specific recommendations are as follows:

PUBLIC RELATIONS

1. The Ministry of Environment should make more extensive use of radio, television, and newspapers to inform the public regularly about environmental issues and events in British Columbia. In this way, the Ministry can disseminate factual information to the largest possible audience and avoid being put into a defensive position by media-minded special interest groups. These communications media should also be used to publicize activities of the Fish and Wildlife Branch such as translocation of problem animals, habitat improvement projects, and winter feeding programs. This would make people aware the Branch is concerned with more than managing the harvest and removal of problem animals, which many people perceive as destructive activities.

   News releases on potentially sensitive issues should be channelled through Information Services so that professionals experienced in newspaper journalism can review the text to minimize the possibility of misinterpretation or extreme revision by outside editors.

2. The Conservation and Outdoor Recreation Education (C.O.R.E.) program should be expanded and publicized so that people of varied wildlife interests (not just hunters) are brought together in this common learning environment. Specifically, the sections of the program that are optional (ecology, wildlife photography, and freshwater fisheries) should be mandatory. If demand warrants, other topics such as identification of non-game birds and mammals should also be considered for inclusion. This expansion is necessary to promote understanding between wildlife users and increase general public awareness.

3. The pamphlet developed by the Provincial Problem Wildlife Committee, entitled Predator Problem?, should be updated and distributed to ranchers and other interested individuals. This is a preventative measure designed to make stock-owners aware of proper livestock management practices and prevent ambiguity about the Fish and Wildlife Branch's policy on predator control in cases of livestock harassment or damage.

4. The Fish and Wildlife Branch should approach the British Columbia Parks Branch and Parks Canada in an effort to

increase public awareness of the wolf through the interpretive programs conducted by these agencies. The feasibility of conducting wolf howling nights in selected locations should also be investigated.

NEEDED RESEARCH

1. The Ministry of Environment should investigate the available mechanisms for best incorporating public input into wildlife management decisions. This is necessary to facilitate effective two-way communications between the Ministry and its external publics and to reduce the feeling of alienation among some public interest groups. The first step in this process is a commitment by the Ministry to recognize and incorporate public opinion into the decision-making process. The second step is investigation of the various alternatives available for soliciting public opinion.

   The established problem wildlife management advisory committees are a step towards this objective; however, several shortfalls are evident:

   a. Due to the restricted participation and infrequent meetings, the committees do no represent a readily available vehicle for public input by a range of individuals.

   b. Many people simply are not aware of the committees or their function.

   c. Non-consumptive wildlife enthusiasts generally view the committees with skepticism because of the committee composition, which is perceived as biased towards livestock protection and consumptive wildlife use.

2. The Ministry of Environment should establish an integrated agriculture-wildlife research program similar to the Integrated Wildlife Intensive Forestry Research (IWIFR) program developed between the Ministries of Environment and Forests. The major purposes of such a program would be:

   a. to improve communications and cooperation between the two ministries,

   b. to share funding of research projects pertinent to both ministries.

   Some general research topics relating to predators and livestock include:

   a. Relationships between range type and condition, animal husbandry practices, and wolf depredation on livestock.

b. Behavioural and ecological features of wolves and livestock depredation.

c. Relationships between land development for agriculture and wildlife in northern British Columbia.

d. An economic assessment of predator damage to livestock in British Columbia.

e. A comparative evaluation of lethal wolf control techniques in British Columbia. Parameters include:

- cost-effectiveness
- humaneness
- environmental impacts
- social acceptability
- biological effectiveness

f. Non-lethal alternatives to wolf control for the protection of domestic livestock.

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APPENDIX A

The survey questionnaire used
in this study

5 ☐ 1. Which of the following best describes the location of your permanent residence?
- 1 ○ rural (less than 1,000 people)
- 2 ○ urban (1,000 - 9,999 people)
- 3 ○ city (more than 9,999 people)

16 ☐

6 ☐ 2. Which of the following best describes the area you grew up in?
- 1 ○ rural (less than 1,000 people)
- 2 ○ urban (1,000 - 9,999 people)
- 3 ○ city (more than 9,999 people)

7 ☐ 3. In which of the following regions is your permanent residence located? If you are unsure which region you live in give the name of the nearest town or city in the space provided below.

city/town _____

- 1 ○ Vancouver Island
- 2 ○ Lower Mainland
- 3 ○ Thompson
- 4 ○ Kootenay
- 5 ○ Cariboo
- 6 ○ Skeena
- 7 ○ Omenica Peace
- 8 ○ Okanagan

17 ☐
18 ☐
19 ☐
20 ☐
21 ☐
22 ☐
23 ☐

8 ☐ 4. What is your age? _____

24 ☐

9 ☐ 5. Your sex?
- 1 ○ female
- 2 ○ male

10 ☐ 6. Do you work (directly or indirectly) in one of the following resource areas?
- 1 ○ agriculture
- 2 ○ forestry
- 3 ○ mining
- 4 ○ fishing
- 5 ○ other (specify)

_____

11 ☐ 7. Which of the following most accurately describes your formal educational background?
- 1 ○ less than 12 years
- 2 ○ high school graduate
- 3 ○ trade or technical school
- 4 ○ some college or university
- 5 ○ university graduate

25 ☐

12 ☐ 8. Do you own cattle or sheep that are being raised in British Columbia?
- 1 ○ yes
- 2 ○ no

26 ☐

13 ☐ 9. Do you currently (1981) have a license allowing you to trap wolves or act as a hunting guide in British Columbia? If so please check the appropriate circle. (If not go to question 10.)
- 1 ○ guide
- 2 ○ fur trapper

27 ☐

14 ☐ 10. At present, which of the following best describes your personal interest in British Columbia's wildlife?
- 1 ○ hunting or trapping
- 2 ○ reading about/viewing on T.V.
- 3 ○ observing/photographing
- 4 ○ no interest in B.C. wildlife
- 5 ○ other (specify)

_____

28 ☐

15 ☐ 11. Within the last five years have you applied for a license to hunt any big game animal in British Columbia?
- 1 ○ yes
- 2 ○ no

12. Are you a member of a group or organization that has some interest in wildlife or the management of wildlife?

1 ○ yes (name of group) _____
2 ○ no

13. From the list below indicate the sources through which you most often get information regarding wildlife or wildlife management in British Columbia.

1 ○ radio, television
2 ○ newspapers, magazines
3 ○ journals, books
4 ○ friends, neighbours
5 ○ government employees (conservation officers, park naturalists etc.)
6 ○ government publications
7 ○ other (specify) _____

14. In British Columbia there are public advisory committees set up to discuss problem wildlife issues. There is one provincial committee and seven regional ones. The provincial committee has 8 members, 2 from the Ministry of Agriculture, 2 from the Fish & Wildlife Branch, and one each from the B.C. Federation of Agriculture, the B.C. Wildlife Federation, the B.C. Federation of Naturalists and the B.C. Cattleman's Association. Do you feel your particular interests are adequately represented by this particular committee makeup?

1 ○ yes (go to question 16)
2 ○ no opinion (go to question 16)
3 ○ no (go to question 15)

15. Why not? _____

16. How would you personally describe the population of wolves in British Columbia?

1 ○ extremely scarce
2 ○ scarce
3 ○ common
4 ○ plentiful
5 ○ extremely plentiful
6 ○ don't know

17. How would you personally describe the population of wolves in your region of the province? (Where your permanent residence is located.)

1 ○ extremely scarce
2 ○ scarce
3 ○ common
4 ○ plentiful
5 ○ extremely plentiful
6 ○ don't know

18. Do you feel that the present level of wolf control by the Fish & Wildlife Branch poses a serious threat to the long-term existence of wolves in British Columbia?

1 ○ yes
2 ○ no
3 ○ no opinion

Please read each of the following statements; after reading, carefully analyze each in light of your own personal opinion on that particular subject. Indicate the degree of your agreement relative to each statement in the space provided.

		strongly agree	agree	no opinion	disagree	strongly disagree	
29 ☐	19. Major declines in some provincial prey populations (deer, moose, elk, caribou, mountain sheep) are due largely to predation by bears and wolves.	○	○	○	○	○	40 ☐ 41 ☐
30 ☐	20. Local declines in some prey populations are due largely to predation by bears and wolves.	○	○	○	○	○	
31 ☐	21. When wolves are a confirmed problem the policy of the Fish & Wildlife Branch is to control the problem animals, not the population.	○	○	○	○	○	42 ☐
32 ☐	22. Without a control program in ranching areas many more wolves would begin to prey upon livestock.	○	○	○	○	○	43 ☐ 44 ☐ 45 ☐ 46 ☐
33 ☐	23. Dependance upon domestic cattle and sheep is contributing to a greatly increased density of wolves in some parts of British Columbia.	○	○	○	○	○	47 ☐
34 ☐	24. Disturbance and loss of cattle due to wolves is a serious economic threat to the beef industry in British Columbia.	○	○	○	○	○	
35 ☐	25. Damage to livestock by wolves poses a serious economic threat to some individual stock owners in British Columbia.	○	○	○	○	○	48 ☐
36 ☐	26. The maximum number of individual poison wolf baits that may be set out in one year by the Fish & Wildlife Branch is 250.	○	○	○	○	○	
37 ☐	27. 1080 is a non-specific poison having an equally strong effect upon all animals that consume it.	○	○	○	○	○	49 ☐
38 ☐	28. The present use of 1080 by the Fish & Wildlife Branch for wolves is a major threat to other wildlife in British Columbia.	○	○	○	○	○	
39 ☐	29. If wolf control were left in the hands of individual landowners rather than the Fish & Wildlife Branch, a greater threat to wolves and other wildlife would result than from the present program.	○	○	○	○	○	50 ☐

Rather than controlling wolves in agricultural areas, some people suggest that the government compensate livestock owners for the value (full market value) of the lost animals. If such a program were started each complaint of wolf damage would be investigated before any compensation was paid, as occurs now before control is undertaken.

30. Would you favor such a compensation program if the costs were the same as those of controlling wolves in agricultural areas?
1 ○ yes
2 ○ no
3 ○ no opinion

31. Would you favor such a compensation program if the costs proved to be much greater than those of controlling wolves in agricultural areas?
1 ○ yes
2 ○ no
3 ○ no opinion

32. Assuming that a wolf must be removed from the population and that all methods are carried out by concerned and experienced professionals, are there any of the following control methods that you consider to be grossly inhumane. (You may check more than one answer.)

1 ○ shooting
2 ○ leghold trap
3 ○ neck snare
4 ○ poison (1080)
5 ○ none of these methods are grossly inhumane
6 ○ no opinion

The following are two of the stated wolf management objectives of the Fish & Wildlife Branch:
1) To maintain viable populations of wolves in wilderness areas.
2) To control wolves in well established livestock management areas to reduce livestock losses.

33. In your personal opinion, do you feel one of these objectives is of greater importance than the other?
1 ○ both objectives are equally important
2 ○ objective number 1 is more important
3 ○ objective number 2 is more important
4 ○ no opinion

34. Do you think that one of these objectives is receiving greater priority in the current management of wolves in British Columbia?
1 ○ neither is receiving greater priority
2 ○ objective number 1 is receiving greater priority
3 ○ objective number 2 is receiving greater priority
4 ○ no opinion

35. Do you feel that the present level of wolf control by the Fish & Wildlife Branch poses a serious threat to the long term existence of wolves in British Columbia?
1 ○ yes
2 ○ no
3 ○ no opinion

51☐ 36. Do you feel there is another remedy to the wolf-livestock problem other than controlling wolves? If so, please provide a brief description below.

_____
_____
_____
_____

52☐ 37. Do you know of any techniques for managing wolves other than shooting, trapping or poisoning that you think are more effective? If so, please provide a brief description below.

_____
_____
_____
_____

53☐ 38. Do you know of any other techniques for managing wolves that are equally effective as shooting, trapping or poisoning but that you feel are more humane? If so, please provide a brief description below.

_____
_____
_____
_____

APPENDIX B

Covering letter for the survey questionnaire

SIMON FRASER UNIVERSITY, BURNABY, B.C., CANADA V5A 1S6

Dear Madam or Sir:

I am a graduate student in the Natural Resource Management program at Simon Fraser University, and this survey questionnaire is an important part of my research into the wolf control controversy in British Columbia. The purpose of the questionnaire is twofold:

(1) To make the publics' views on wildlife issues known to the Provincial government to aid in policy formation and decision making.

(2) To help in the development of more efficient communication between government and the public.

It is not possible to survey all members of the public, thus it is extremely important that those individuals who do receive a questionnaire respond to it. A wide variety of topics are covered in the questionnaire and you may not be knowledgable on all of them. Please attempt to answer each question as best you can. If you do not have an opinion on an issue please check the "no opinion" or "don't know" response for that question. It is important that some response is indicated, otherwise it must be assumed that the question was missed.

The entire questionnaire should take no more than fifteen minutes to complete and you are assured of complete confidentiality. There is nothing in the questionnaire that will identify you personally. A return envelope with pre-paid postage is included. I thank you for your time and look forward to your response.

Sincerely,

Natural Resource Management Program
Simon Fraser University
Burnaby, British Columbia
V5A 1S6

APPENDIX C

Follow-up letter to the
survey questionnaire

SIMON FRASER UNIVERSITY, BURNABY, B.C., CANADA V5A 1S6

Dear Madam or Sir:

Two weeks ago I mailed you a questionnaire concerning wolf control in British Columbia. If you have already responded then simply ignore this letter. If you have not returned the completed questionnaire please do so as soon as possible. Your response is important.

As outlined in an earlier letter much of my research is based upon this survey, and the results will be used in my graduating thesis. Also, I hope that the survey results will help to facilitate better communications and understanding between the provincial government and the public regarding wildlife management in British Columbia. Thanks for your assistance.

Sincerely,

Robin Hoffos
Natural Resource Management Program
Simon Fraser University
Burnaby, British Columbia
V5A 1S6

APPENDIX D

List of interviewees

LIST OF INTERVIEWEES

Blazowski, H. Secretary, British Columbia Cattlemen's Assoc. Kamloops, British Columbia. (Interview: May 22, 1981).

Child, K. Regional Wildlife Biologist, British Columbia Ministry of Environment, Fish and Wildlife Branch. Prince George, British Columbia. (Interview: December 2, 1981).

Clements, G. Association for the Protection of Fur-bearing Animals. Vancouver, British Columbia. (Interivew: May 15, 1981).

Eastman, D. Biologist in charge of Wildlife Research. British Columbia Ministry of Environment, Fish and Wildlife Branch. (Interview: May 19, 1981).

Harper, F. Wildlife Biologist, British Columbia Ministry of Environment, Fish and Wildlife Branch. Ft. St. John, British Columbia. (Interview: December 4, 1981).

Hatter, J. Former Director, British Columbia Fish and Wildlife Branch. (address to Wolves II conference; University of Victoria, Victoria, British Columbia: March 30, 1982).

Hebert, D. Regional Wildlife Biologist, British Columbia Ministry of Environment, Fish and Wildlife Branch. Williams Lake, British Columbia. (formerly regional wildlife biologist in Nanaimo, B.C.). (Interview: Nov. 17, 1982).

Johnson, G. District Agrologist, British Columbia Ministry of Agriculture and Food. Smithers, British Columbia. (Interview: Dec. 1, 1981).

Jones, T. Ministry of Environment, Information and Education Branch. Victoria, British Columbia. (Interview: May 20, 1981).

Kidder, J. British Columbia Ministry of Environment, Financial Assistance. Victoria, British Columbia. (Telephone interview: April 19, 1982).

Lay, A. Animal Control Officer, British Columbia Ministry of Environment. Prince George, British Columbia. (Interview: Dec. 2, 1981).

Minunzie, N. Federation of British Columbia Naturalists, Citizens Association for the conservation of Predators. Langley, British Columbia. (Interview: May 18, 1981).

Otway, B. President, British Columbia Wildlife Federation. Cloverdale, British Columbia. (Interview: May 16, 1981).

Pelter, J.A. Director, Livestock Branch, British Columbia Ministry of Agriculture and Food. Victoria, British Columbia. (Telephone interview: May 19, 1981).

Tompa, F. Staff specialist, Carnivore Management, British Columbia Ministry of Environment, Fish and Wildlife Branch. Victoria, British Columbia. (Interview: May 19, 1981).

van Drimmelen, B. Regional Wildlife Biologist. British Columbia Ministry of Environment, Fish and Wildlife Branch. Smithers, British Columbia. (Interview: Nov. 30, 1981).

Ward, S. Animal Control Officer. British Columbia Ministry of Environment. Smithers, British Columbia. (Interview: Nov. 30, 1981).

Warren, M. Administrator, Conservation and Outdoor Recreation Education Program (C.O.R.E.), (former control officer). British Columbia Ministry of Environment, Fish and Wildlife Branch. Prince George, British Columbia. (Interview: December 2, 1981).

Copies of Wildlife Bulletins are available, depending on supply from the British Columbia Wildlife Branch, Ministry of Environment and Parks, Parliament Buildings, Victoria, B.C. V8V 1X5. Titles of Bulletin Nos. 1 to 21 are also available.

No. B-22 Landsat classification for wildlife habitat management and research planning: problem analysis. K.L. Sadoway. December 1980. 36pp. (Also printed as IWIFR-6)

No. B-23 Landsat classification: evaluation of image analysis methodologies for wildlife habitat management and research planning: working plan. K.L. Sadoway. May 1980. 29pp. (Also printed as IWIFR-7)

No. B-24 Landsat classification: evaluation of image analysis methodologies for wildlife habitat management and research planning: final report. K.L. Sadoway, ed. July 1983. 177pp. (Also printed as IWIFR-8)

No. B-25 A bibliography of the wolverine Gulo gulo. V. Banci. June 1982. 53pp. (Also printed as IWIFR-9)

No. B-26 Problem analysis: grizzly bears and coastal development, with particular reference to intensive forestry. W.R. Archibald. September 1982. 24pp.

No. B-27 The wolverine in British Columbia: distribution, methods of determining age and status of Gulo gulo vancouverensis. V.A. Banci. June 1982. 90pp. (Also printed as IWIFR-15)

No. B-28 Vancouver Island Roosevelt elk/intensive forestry interactions: problem analysis. D. Janz, K. Brunt, and J. Youds. December 1980. 36pp. (Also printed as IWIFR-11)

No. B-29 Vancouver Island Roosevelt elk/intensive forestry interactions: working plan 1981-1985. D. Janz, K. Brunt, and J. Youds. December 1980. 60pp. (Also printed as IWIFR-12)

No. B-30 Intensive forestry effects on Vancouver Island deer and elk habitats. J.B. Nyberg. 1985. (Also printed as IWIFR-16)

No. B-31 Trees and snow: the deposition of snow on the ground. A review and quantitative synthesis. F.L. Bunnell, S. McNay, and C.C. Shank. 1985. (Also printed as IWIFR-17)

No. B-32 Vancouver Island Roosevelt elk/intensive forestry interactions. October 1982 - September 1983. K. Brunt, J. Youds, and D. Becker. September 1984. 67pp. (Also printed as IWIFR-13)

No. B-33 Reliability of motion-sensitiveness and radio-collars for estimating activity of blacktail deer. M.P. Gillingham and F.L. Bunnell. 1985. (IWIFR-14; printed in Journal of Wildlife Management. 1985. 49(4): 951-958)

No. B-34 Deer movement and habitat use during winter: working plan. J.B. Nyberg, D. Doyle, and L. Peterson. 1985. (Also printed as IWIFR-18)

No. B-35 Forest crowns, snow interception and management of black-tailed deer winter habitat. R.S. Mcnay. 1985. (Also printed as IWIFR-19)

No. B-36 Comparison of methods for estimating forest overstory cover. D.J. Vales and F.L. Bunnell. 1985. (Also printed as IWIFR-20)

No. B-37 Vancouver Island Roosevelt elk/intensive forestry interactions: progress report 1981-1984. J. Youds, K. Brunt, and D. Becker. 1985. (Also printed as IWIFR-21)

No. B-38 Interactions between black-tailed deer and intensive forest management: problem analysis. R.S. McNay and R. Davies. 1985. (Also printed as IWIFR-22)

No. B-39 The Vancouver Island marmot: status and management plan. W.T. Munro, D.W. Janz, V. Heinsalu, and G.W. Smith. June 1985. 28pp.

No. B-40 Effects of intensive forest management on amphibians and reptiles of Vancouver Island: problem analysis. K.L. Sadoway. 1985. (Also printed as IWIFR-23)

No. B-41 Effects of intensive forest management on non-ungulate mammals of Vancouver Island: problem analysis. K.L. Sadoway. 1985. (Also printed as IWIFR-24)

Continued on back cover

Continued from inside front cover

No. B-42 Effects of intensive forest management on breeding birds of Vancouver Island: problem analysis. K.L. Sadoway. 1985. (Also printed as IWIFR-25)

No. B-43 Enhancing the establishment and growth of arboreal forage lichens in intensively managed forests: problem analysis. S.K. Stevenson. 1985. (Also printed as IWIFR-26)

No. B-44 Managing young forests as black-tailed deer winter range. J.B. Nyberg. 1986. (Also printed as IWIFR-27)

No. B-45 A rationale for wolf control in the management of the predator-ungulate system. D. Janz and I. Hatter. March 1986. 35pp.

No. B-46 Thermoregulation and thermal cover of deer and elk on Vancouver Island: problem analysis. F.L. Bunnell, K.L. Parker, L.L. Kremsater, and S.W. Hovey. 1986. (Also printed as IWIFR-28)

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